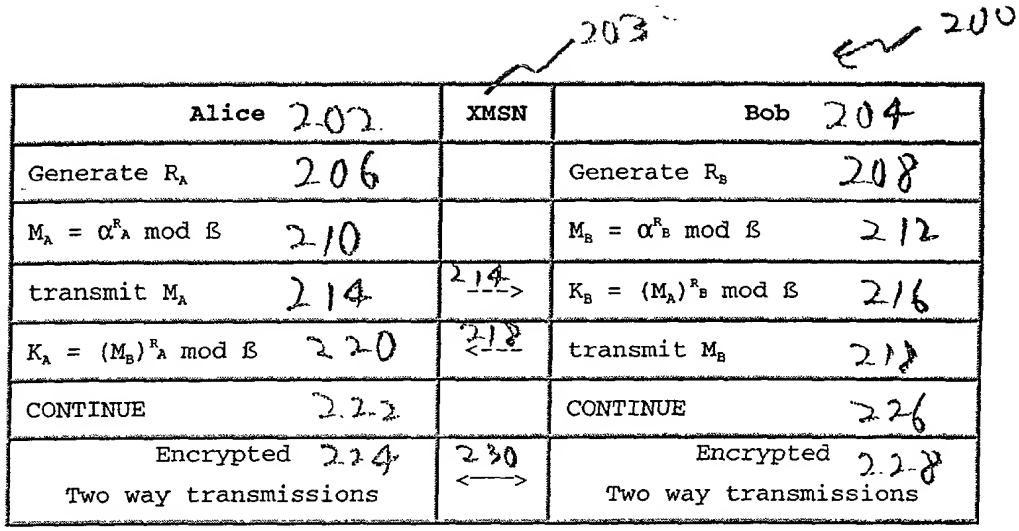
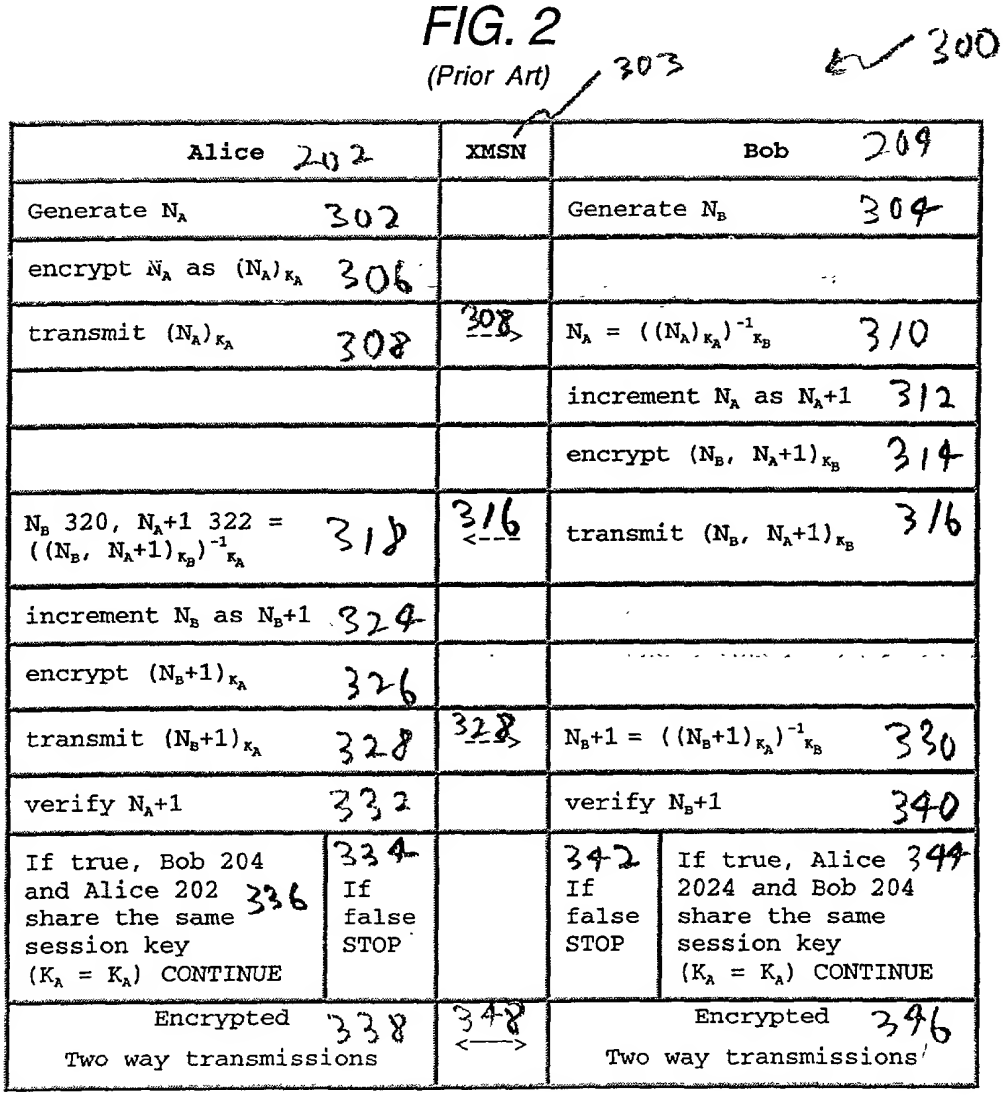
SYMBOL	DESCRIPTION
$f(\ )$	ALICE'S AND BOB'S COMBINING FUNCTION
I_A, I_B	ALICE'S AND BOB'S DISCARDABLE INITIALIZATION VECTOR
K_A, K_B	ALICE'S AND BOB'S PRIVATE SESSION KEY
M_A, M_B	ALICE'S AND BOB'S PUBLIC KEY
N_A, N_B	ALICE'S AND BOB'S RANDOM NONCE FOR KEY VERIFICATION
N_A+1, N_B+1	MODIFIED (INCREMENTED) RANDOM NONCES
α, ß	ALICE'S AND BOB'S CONGRUENT EXPONENTIAL BASE; (ALICE'S AND BOB'S MODULO VARIABLE)
P_A, P_B	ALICE'S AND BOB'S SECRET PASSWORDS
R_A, R_B	ALICE'S AND BOB'S PRIVATE RANDOM NUMBERS
S_A, S_B	ALICE'S AND BOB'S HIGH-ENTROPY SECRET
$(Y)_X$	ENCRYPT CLEARTEXT, Y, WITH KEY X
$(Z)^{-1}_X$	DECRYPT CIPHERTEXT, Z, WITH KEY X
$(N_B)\Sigma^n_{i=2}$	SUPERENCRYPT PLAINTEXT, N_B, WITH VARIABLE KEYS n

FIG. 1



Alice 202	XMSN 203	Bob 204
Generate R_A 206		Generate R_B 208
$M_A = \alpha^{R_A} \bmod ß$ 210		$M_B = \alpha^{R_B} \bmod ß$ 212
transmit M_A 214	214 -->	$K_B = (M_A)^{R_B} \bmod ß$ 216
$K_A = (M_B)^{R_A} \bmod ß$ 220	218 <--	transmit M_B 218
CONTINUE 222		CONTINUE 226
Encrypted 224 Two way transmissions	230 <-->	Encrypted 228 Two way transmissions

FIG. 2
(Prior Art)



Alice 202	XMSN 303	Bob 209
Generate N_A 302		Generate N_B 304
encrypt N_A as $(N_A)_{K_A}$ 306		
transmit $(N_A)_{K_A}$ 308	308 -->	$N_A = ((N_A)_{K_A})^{-1}_{K_B}$ 310
		increment N_A as N_A+1 312
		encrypt $(N_B, N_A+1)_{K_B}$ 314
N_B 320, N_A+1 322 = $((N_B, N_A+1)_{K_B})^{-1}_{K_A}$ 318	316 <--	transmit $(N_B, N_A+1)_{K_B}$ 316
increment N_B as N_B+1 324		
encrypt $(N_B+1)_{K_A}$ 326		
transmit $(N_B+1)_{K_A}$ 328	328 -->	$N_B+1 = ((N_B+1)_{K_A})^{-1}_{K_B}$ 330
verify N_A+1 332		verify N_B+1 340
If true, Bob 204 and Alice 202 share the same session key ($K_A = K_A$) CONTINUE 336 / If false STOP 334		If false STOP 342 / If true, Alice 2024 and Bob 204 share the same session key ($K_A = K_A$) CONTINUE 344
Encrypted 338 Two way transmissions	348 <-->	Encrypted 346 Two way transmissions

FIG. 3
(Prior Art)

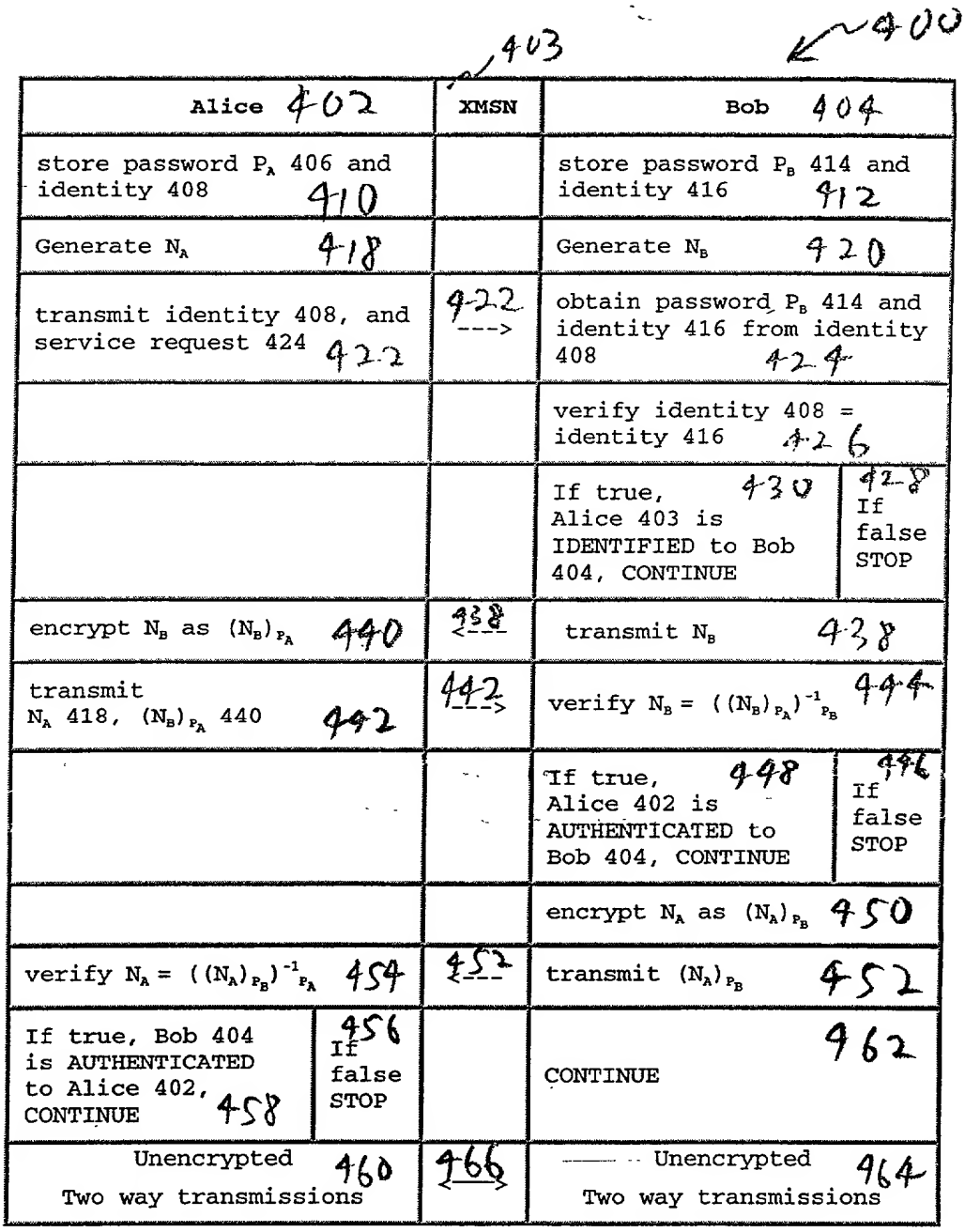

403
400
Alice 402
XMSN
Bob 404
store password P_A 406 and identity 408 410
store password P_B 414 and identity 416 412
Generate N_A 418
Generate N_B 420
transmit identity 408, and service request 424 422
422 --->
obtain password P_B 414 and identity 416 from identity 408 424
verify identity 408 = identity 416 426
If true, 430 Alice 403 is IDENTIFIED to Bob 404, CONTINUE
If false 428 STOP
encrypt N_B as $(N_B)_{P_A}$ 440
438 <---
transmit N_B 438
transmit N_A 418, $(N_B)_{P_A}$ 440 442
442 --->
verify $N_B = ((N_B)_{P_A})^{-1}_{P_B}$ 444
If true, 448 Alice 402 is AUTHENTICATED to Bob 404, CONTINUE
If false 446 STOP
encrypt N_A as $(N_A)_{P_B}$ 450
verify $N_A = ((N_A)_{P_B})^{-1}_{P_A}$ 454
452 <---
transmit $(N_A)_{P_B}$ 452
If true, Bob 404 is AUTHENTICATED to Alice 402, CONTINUE 458
If false 456 STOP
462
CONTINUE
Unencrypted Two way transmissions 460
466
Unencrypted Two way transmissions 464

FIG. 4

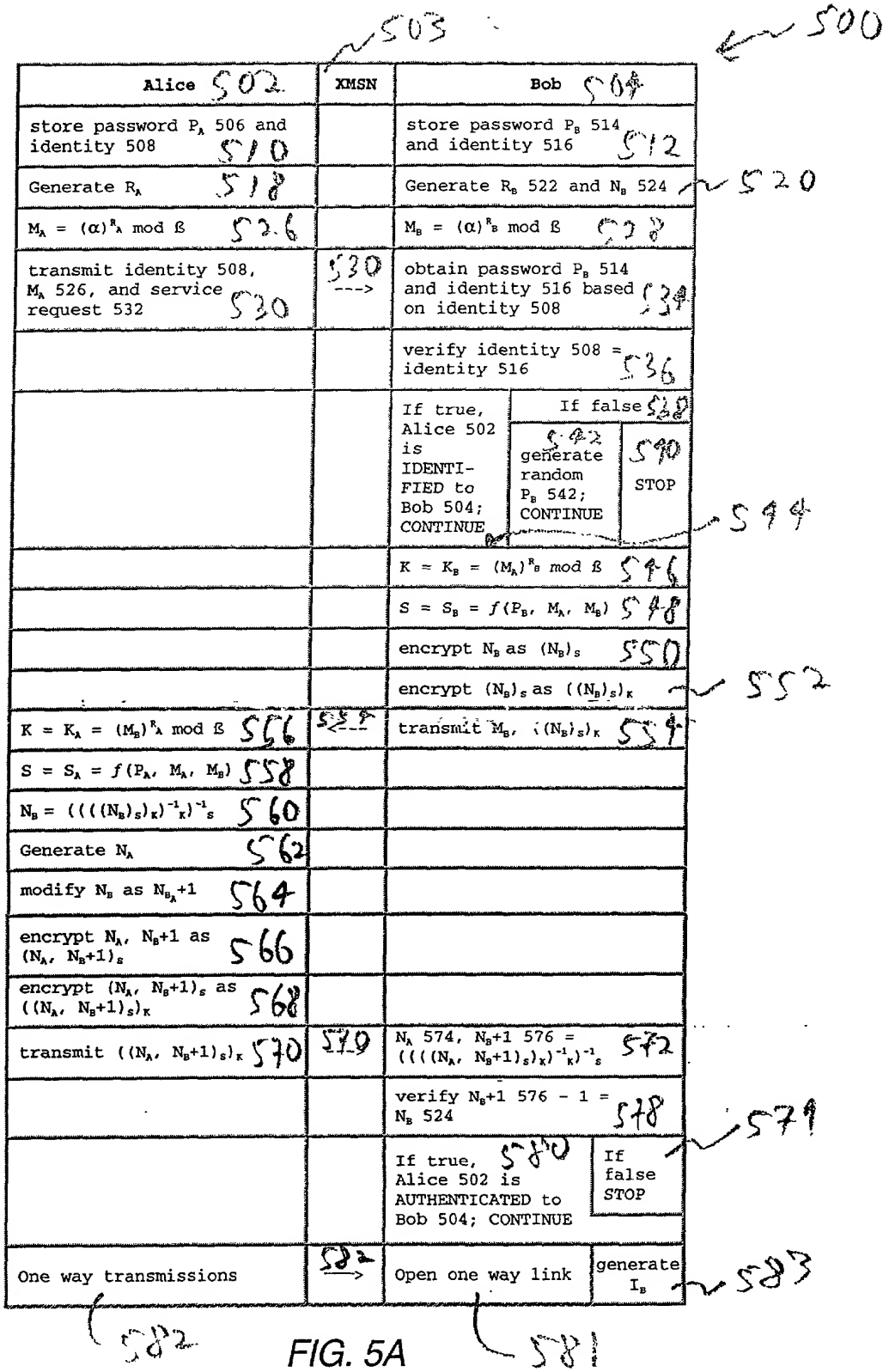

500
503
Alice 502
XMSN
Bob 504
store password P_A 506 and identity 508 510
store password P_B 514 and identity 516 512
Generate R_A 518
Generate R_B 522 and N_B 524 520
$M_A = (\alpha)^{R_A} \bmod ß$ 526
$M_B = (\alpha)^{R_B} \bmod ß$
transmit identity 508, M_A 526, and service request 532 530
530 --->
obtain password P_B 514 and identity 516 based on identity 508 534
verify identity 508 = identity 516 536
If true, Alice 502 is IDENTIFIED to Bob 504; CONTINUE
If false 538
generate random P_B 542; CONTINUE
STOP 540
544
$K = K_B = (M_A)^{R_B} \bmod ß$ 546
$S = S_B = f(P_B, M_A, M_B)$ 548
encrypt N_B as $(N_B)_S$ 550
encrypt $(N_B)_S$ as $((N_B)_S)_K$ 552
$K = K_A = (M_B)^{R_A} \bmod ß$ 556
554
transmit M_B, $((N_B)_S)_K$ 554
$S = S_A = f(P_A, M_A, M_B)$ 558
$N_B = ((((N_B)_S)_K)^{-1}_K)^{-1}_S$ 560
Generate N_A 562
modify N_B as $N_{B_A}+1$ 564
encrypt N_A, N_B+1 as $(N_A, N_B+1)_S$ 566
encrypt $(N_A, N_B+1)_S$ as $((N_A, N_B+1)_S)_K$ 568
transmit $((N_A, N_B+1)_S)_K$ 570
570
N_A 574, N_B+1 576 = $((((N_A, N_B+1)_S)_K)^{-1}_K)^{-1}_S$ 572
verify N_B+1 576 - 1 = N_B 524 578
579
If true, Alice 502 is AUTHENTICATED to Bob 504; CONTINUE 580
If false STOP
One way transmissions
582
Open one way link
generate I_B 583
582
581

FIG. 5A

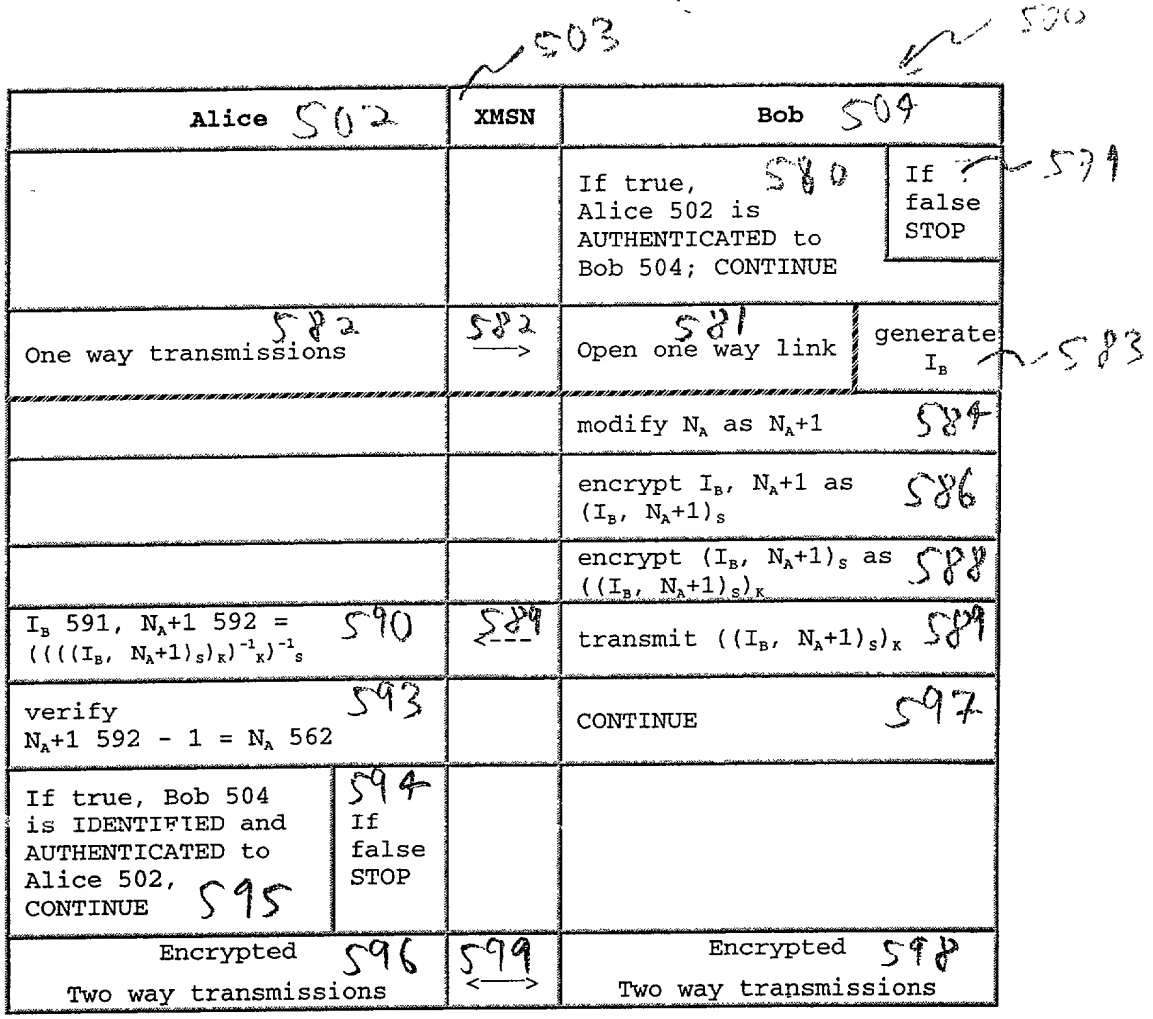

503
500
Alice 502
XMSN
Bob 509
If true, Alice 502 is AUTHENTICATED to Bob 504; CONTINUE 580
If false STOP 579
One way transmissions 582
582
Open one way link 581
generate I_B 583
modify N_A as N_A+1 584
encrypt I_B, N_A+1 as $(I_B, N_A+1)_S$ 586
encrypt $(I_B, N_A+1)_S$ as $((I_B, N_A+1)_S)_K$ 588
I_B 591, N_A+1 592 = $((((I_B, N_A+1)_S)_K)^{-1}_K)^{-1}_S$ 590
589
transmit $((I_B, N_A+1)_S)_K$ 589
verify N_A+1 592 - 1 = N_A 562 593
CONTINUE 597
If true, Bob 504 is IDENTIFIED and AUTHENTICATED to Alice 502, CONTINUE 595
If false STOP 594
Encrypted Two way transmissions 596
599
Encrypted Two way transmissions 598

FIG. 5B

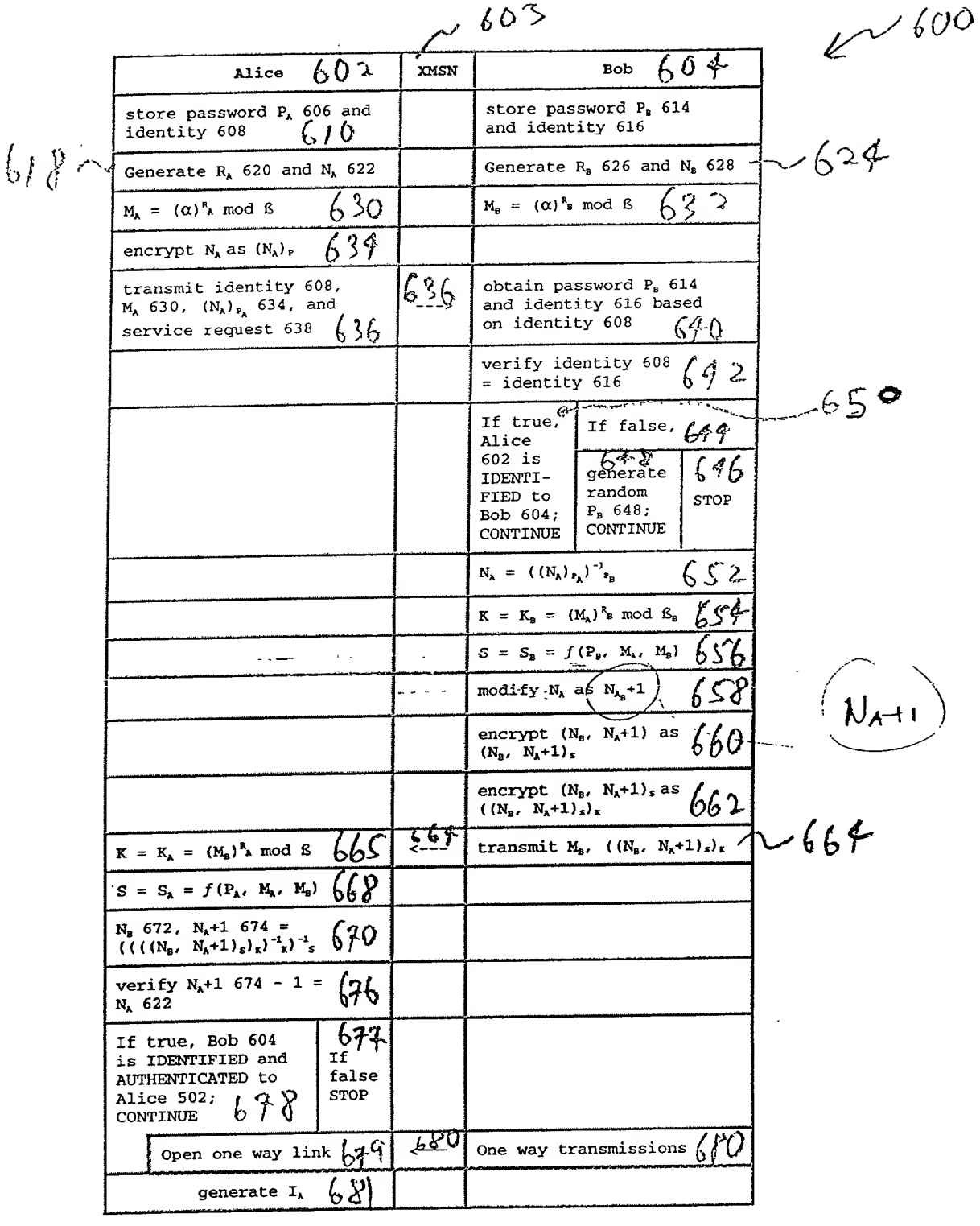

603
600
Alice 602
XMSN
Bob 604
store password P_A 606 and identity 608 610
store password P_B 614 and identity 616
618
Generate R_A 620 and N_A 622
Generate R_B 626 and N_B 628
624
$M_A = (\alpha)^{R_A} \bmod ß$ 630
$M_B = (\alpha)^{R_B} \bmod ß$ 632
encrypt N_A as $(N_A)_P$ 634
transmit identity 608, M_A 630, $(N_A)_{P_A}$ 634, and service request 638 636
636
obtain password P_B 614 and identity 616 based on identity 608 640
verify identity 608 = identity 616 642
650
If true, Alice 602 is IDENTIFIED to Bob 604; CONTINUE
If false, 644
generate random P_B 648; CONTINUE
646 STOP
$N_A = ((N_A)_{P_A})^{-1}_{P_B}$ 652
$K = K_B = (M_A)^{R_B} \bmod ß_B$ 654
$S = S_B = f(P_B, M_A, M_B)$ 656
modify N_A as $N_{A_B}+1$ 658
N_A+1
encrypt (N_B, N_A+1) as $(N_B, N_A+1)_S$ 660
encrypt $(N_B, N_A+1)_S$ as $((N_B, N_A+1)_S)_K$ 662
$K = K_A = (M_B)^{R_A} \bmod ß$ 665
667
transmit M_B, $((N_B, N_A+1)_S)_K$ 664
$S = S_A = f(P_A, M_A, M_B)$ 668
N_B 672, N_A+1 674 = $((((N_B, N_A+1)_S)_K)^{-1}_K)^{-1}_S$ 670
verify N_A+1 674 - 1 = N_A 622 676
If true, Bob 604 is IDENTIFIED and AUTHENTICATED to Alice 502; CONTINUE 678
677 If false STOP
Open one way link 679
680
One way transmissions 680
generate I_A 681

FIG. 6A

Alice 602		XMSN	Bob 604	
If true, Bob 604 is IDENTIFIED and AUTHENTICATED to Alice 502; CONTINUE 678	If false 677 STOP			
Open one way link 679		680	One way transmissions 680	
generate I_A 681				
modify N_B as N_B+1 682				
encrypt I_A, N_B+1 as $(I_A, N_B+1)_S$ 683				
encrypt $(I_A, N_B+1)_S$ as $((I_A, N_B+1)_S)_K$ 684				
transmit $((I_A, N_B+1)_S)_K$ 685		685	I_{A_B} 687, N_B+1 688 = $((((I_A, N_B+1)_S)_K)^{-1}_K)^{-1}_S$ 686	
CONTINUE 696			verify N_B+1 688 - 1 = N_B 628 690	
			If true, Alice 602 is AUTHENTICATED to Bob 604; CONTINUE 693	If false 692 STOP
Encrypted Two way transmissions 698		699	Encrypted Two way transmissions 694	

FIG. 6B

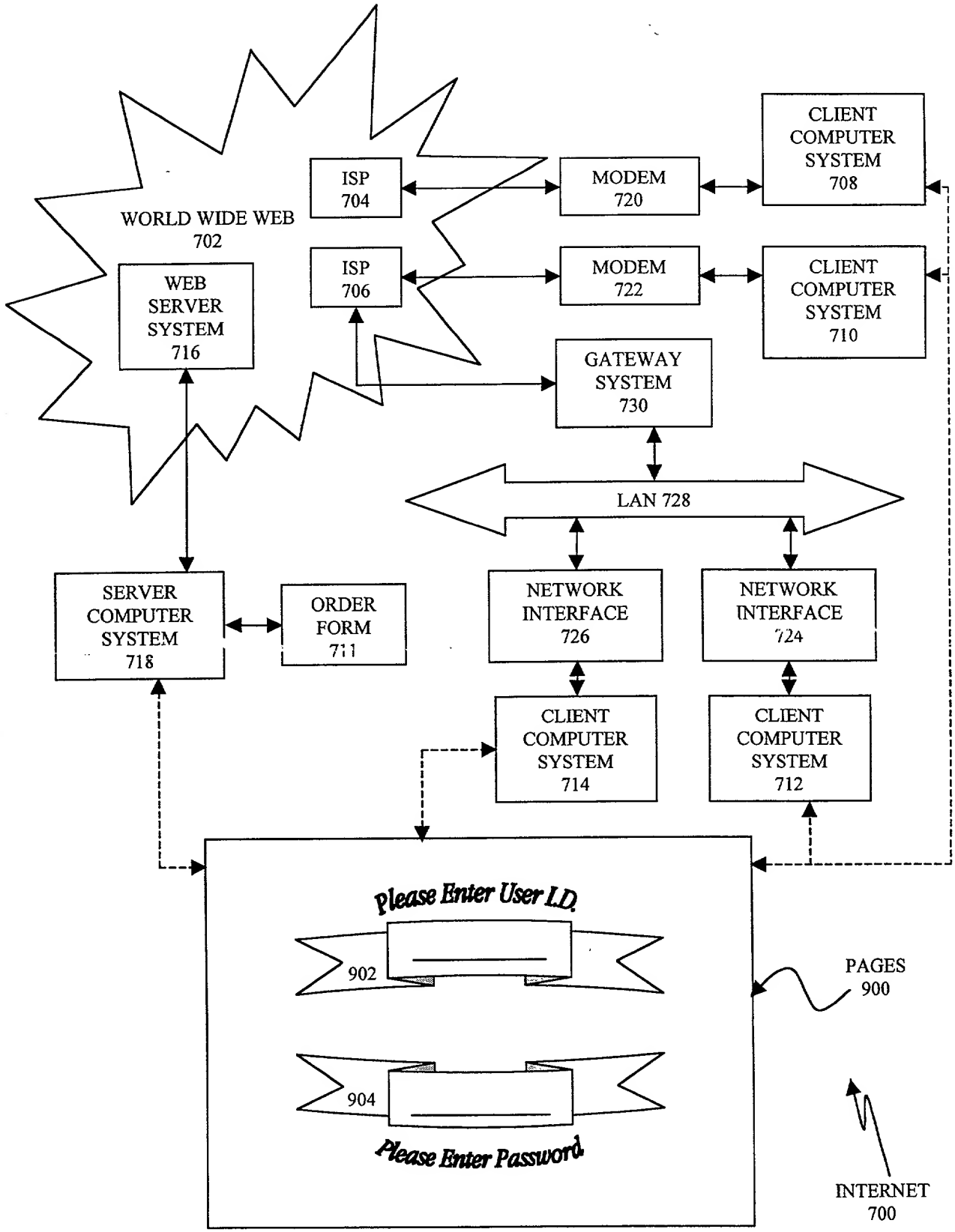

WORLD WIDE WEB
702
ISP
704
ISP
706
MODEM
720
MODEM
722
CLIENT
COMPUTER
SYSTEM
708
CLIENT
COMPUTER
SYSTEM
710
WEB
SERVER
SYSTEM
716
GATEWAY
SYSTEM
730
LAN 728
SERVER
COMPUTER
SYSTEM
718
ORDER
FORM
711
NETWORK
INTERFACE
726
NETWORK
INTERFACE
724
CLIENT
COMPUTER
SYSTEM
714
CLIENT
COMPUTER
SYSTEM
712
Please Enter User I.D.
902
904
Please Enter Password
PAGES
900
INTERNET
700

FIG. 7

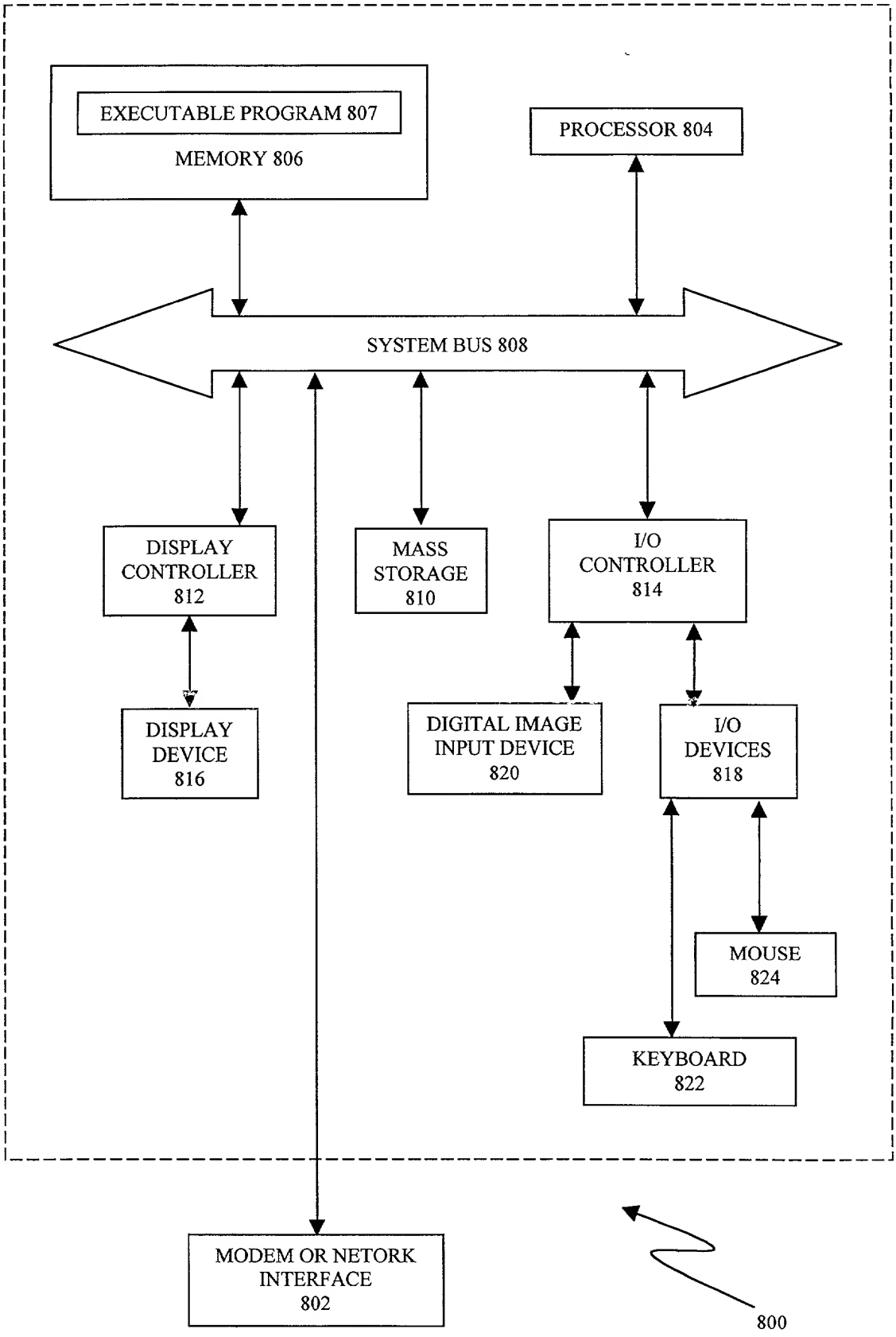

EXECUTABLE PROGRAM 807
MEMORY 806
PROCESSOR 804
SYSTEM BUS 808
DISPLAY CONTROLLER 812
MASS STORAGE 810
I/O CONTROLLER 814
DISPLAY DEVICE 816
DIGITAL IMAGE INPUT DEVICE 820
I/O DEVICES 818
MOUSE 824
KEYBOARD 822
MODEM OR NETORK INTERFACE 802
800

FIG. 8